# IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

**Patent Application**

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| **Inventor(s)** | Daniel Scott Homa | | |
| **Case** | 073103-1 | **Conf. No.** | 8739 |
| **Serial No.** | 10/687,454 | **Group Art Unit** | 1731 |
| **Filing Date** | October 16, 2003 | | |
| **Examiner** | Queenie S. Dehghan | | |
| **Title** | **Hydrogen Resistant Optical Fiber Formation Technique** | | |

**COMMISSIONER FOR PATENTS**
**ALEXANDRIA, VA 22313**

**SIR:**

## BRIEF ON APPEAL

## I. INTRODUCTION

Appellant submits this Brief on Appeal in support of a Notice of Appeal filed June 29, 2007, the Notice of Appeal having been filed upon receipt of a Final Office Action from the Examiner dated June 1, 2007 affirming the final rejection of pending claims 1-20.

## II. REAL PARTY IN INTEREST

Luna Energy, LLC is the real party in interest by virtue of an Assignment recorded in the United States Patent and Trademark Office on October 16, 2003.

## III. RELATED APPEALS AND INTERFERENCES

This is the first appeal in the above-identified application.

## IV. STATUS OF CLAIMS

Claims 1-20 are pending in this application and all stand rejected. The final rejection of claims 1-20 is being appealed

## V. STATUS OF AMENDMENTS

No amendments have been filed subsequent to the receipt of the final rejection.

## VI. SUMMARY OF CLAIMED SUBJECT MATTER

The following is a concise explanation of the subject matter as defined in independent claim 1, referring to the specification by page and line number, and the associated drawings. In particular, reference is made to the specification at page 2, line 28 (i.e., paragraph **[0009]**) where it states:

> An initial unsintered porous soot is first formed on the inner surface of a preform tube. The unsintered soot can be deposited by a method similar to that used for solution doping of a fiber preform, where an extremely porous, unsintered soot is subsequently used as a "sponge" for absorbing a liquid dopant. In the process of the present invention, the extremely porous unsintered soot is then subjected to a flow of a metal halide (e.g., $SiCl_4$) in an environment of, for example, He and/or $N_2$ for a predetermined period of time. *Importantly, no oxygen is present during this flow process*. The resulting structure is then sintered in a $SiCl_4/He/N_2$ environment to form the amorphous glass and collapsed to form the final preform structure. [emphasis added]

Reference is made to FIGs. 1-3, where the process steps in FIGs. 1 and 2 illustrate the presence of oxygen for the initial steps. In contrast, the step of the present invention related to introducing a metal halide to the unsintered soot (FIG. 3) does not include oxygen as one of the ambient gasses. The following sintering step, as illustrated in FIG. 4, likewise does not include oxygen as one of the ambient gasses.

Concise explanation of independent claim 1

Independent claim 1 is directed to a "method of making an optical preform", and includes a step of "depositing a porous, unsintered soot layer within the inner surface of said tube" followed by a step of "exposing the porous, unsintered soot layer to a flow of a metal halide in a oxygen-free ambient for a period of time sufficient to eliminate the

presence of excess oxygen defects in said soot layer", then following with a step of "sintering the metal halide-treated soot layer in an oxygen-free ambient to form an amorphous glass layer". [emphasis added]

Concise explanation of independent claim 19

Independent claim 19 is directed to a "method of making an optical preform" including a step of "depositing a porous, unsintered soot layer", followed by a step of "sintering the soot layer in an oxygen-free environment of $SiCl_4$, He and $H_2$ to form an amorphous glass layer".

## VII. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The following is a concise statement of each ground of rejection presented for review:

- Claims 1-4, 6-7, 10-12 and 14 were rejected under 35 USC 102(e) as being anticipated by US Patent Application 2002/0150365 (Antos et al.)
- Claims 5, 8 and 9 were rejected under 35 USC 103(a) as being unpatentable over US Patent Application 2002/0150365 (Antos et al.), as applied to claim 1, in view of US Patent 6,532,774 (Zhang et al.)
- Claims 13 and 15 were rejected under 35 USC 103(a) as being unpatentable over US Patent Application 2002/0150365 (Antos et al.), as applied to claim 1, in view of JP 02180729 (Ishikawa et al.)
- Claim 16 was rejected under 35 USC 103(a) as being unpatentable over US Patent Application 2002/0150365 (Antos et al.), as applied to claim 1, in view of US Patent Publication 2003/0213268 (Homa)
- Claim 17 was rejected under 35 USC 103(a) as being unpatentable over US Patent Application 2002/0150365 (Antos et al.), as applied to claim 1, in view of US Patent 6,053,013 (Oh et al.)
- Claim 18 was rejected under 35 USC 103(a) as being unpatentable over US Patent Application 2002/0150365 (Antos et al.), as applied to claim 1, in view of US Patent 4,310,340 (Sakar)
- Claims 19 and 20 were rejected under 35 USC 103(a) as being unpatentable over US Patent Application 2002/0150365 (Antos et al.) in view of JP 02180729

(Ishikawa et al.), US Patent 5,735,921 (Araujo et al.) and US Patent 4,627,160 (Herron et al.)

## VIII. ARGUMENT

### *A. 35 USC § 102(e) Rejection – Claims 1-4, 6-7, 10-12 and 14*

The Examiner first rejected claims 1-4, 6-7, 10-12 and 14 under 35 USC 102(e) as being anticipated by US Patent Publication 2002/0150365 (Antos et al.). The Examiner refers to paragraphs [0017], [0030] and [0033] of Antos et al. as particularly teaching the subject matter of steps c) and d) (the metal halide deposition and sintering steps) of independent claim 1.

In response, appellant assert that there is no disclosure or suggestion in Antos et al. regarding the absence of oxygen during the sintering process, where the performance of this step in an "oxygen-free ambient" is a critical aspect of the present invention. Rather, Antos et al. states at paragraph [0020] that "less than a stoichiometric amount of oxygen" is present in the ambient as the preform is created. Paragraph [0034] of Antos et al. suggests that a "surplus" of oxygen should be eliminated, but does not require all that oxygen be eliminated from the ambient; the limitation of Antos et al. is to use "less than a stoichiometric amount". The Examiner further stated (at page 6 of the *Detailed Action* in the Examiner's final rejection) that Antos et al. "clearly provides" an example of an "oxygen free ambient" in example 2 ([0043]), "wherein only He and GeCl4 gases are used for the treatment".

The discovery of the present invention is resident in the finding that by using an oxygen-free ambient, the defects may be eliminated from the soot layer. Independent claim 1 positively recites this requirement in steps c) and d). Antos et al. merely suggests that the oxygen be less than a stoichiometric amount. While applicant agrees that only He and $GeCl_4$ are used for the "treatment" in example 2, the example clearly describes the process as occurring in a furnace and heated to 1000°, where there will be oxygen present in the ambient. It is precisely the components of the ambient that are addressed in the process of the method of the present invention, where the proper combination of (oxygen-free) ambient and flow gases that achieves the desired result of eliminating excess oxygen.

Appellant thus asserts that Antos et al. does not anticipate the inventive method of utilizing an "oxygen-free ambient" during the steps of exposing the unsintered soot to a metal halide and/or sintering the halide-treated soot. Without this teaching, Antos et al. cannot be found to anticipate independent claim 1, or claims 2-4, 6-7, 10-12 and 14.

Appellant therefore respectfully requests the Board of Appeals to reconsider these arguments, reverse the Examiner's rejection, and find claims 1-4, 6-7, 10-12 and 14 to be in condition for allowance.

***B. 35 USC § 103(a) Rejection – Claims 5, 8 and 9***

Claims 5, 8 and 9 were next rejected by the Examiner under 35 USC 103(a) as being unpatentable over Antos et al. (as applied to claim 1, above), when further considered with US Patent 6,532,774 (Zhang et al.). The Examiner cited Zhang et al. as teaching "an example of MCVD where soot is deposited at a lower temperature of 1650°C". Regardless of the teaching of Zhang et al., appellant asserts that the combination still lacks any teaching of utilizing an "oxygen-free ambient" during metal halide deposition and sintering, as required by steps c) and d) of independent claim 1 (from which claims 5, 8 and 9 depend).

Appellant therefore asserts that the combination of Zhang et al. with Antos et al. cannot be found to render obvious the subject matter of claims 5, 8 and 9 and respectfully requests the Board of Appeals to reverse the Examiner's rejection and find these claims to be in condition for allowance.

***C. 35 USC § 103(a) Rejection – Claims 13 and 15***

The Examiner next rejected claims 13 and 15 under 35 USC 103(a) as unpatentable over Antos et al. (as applied to claim 1, above) when considered with Japanese Patent JP 02180729 (Ishikawa et al.), where Ishikawa et al. was cited as teaching the treatment of a "soot preform with a metal halide in the ambient of He and $N_2$ as well as a sintering in an ambient of He and $N_2$". Various paragraphs within the Japanese reference include a reference to $SiO_2$ with respect to the "tube" in which the core rod is vitrified. There is no mention of an "oxygen-free ambient" in this text, or in the previously-cited Antos et al. reference.

Without this teaching, appellant asserts that the combination of Ishikawa et al. with Antos et al. cannot be found to render obvious the subject matter of claims 13 and

15. Appellant thus respectfully requests the Board of Appeals to reverse the Examiner's rejection and find these claims to be in condition for allowance.

***D. 35 USC § 103(a) Rejection – Claim 16***

Claim 16 was rejected under 35 USC 103(a) as being unpatentable over Antos et al., as applied to claim 1 above, in view of US Patent Application 2003/0213268 (Homa), where Homa was cited as teaching a preferred temperature to use for the sintering process. However, the combination of Antos et al. and Homa still lacks any teaching related to using an "oxygen-free ambient" in the formation of an optical fiber preform.

In light of this missing aspect of independent claim 1, appellant believes that dependent claim 16 is allowable in its dependent form and respectfully requests the Board of Appeals to reconsider and reverse the Examiner's final rejection of claim 16.

***E. 35 USC § 103(a) Rejection – Claim 17***

The Examiner next rejected claim 17 under 35 USC 103(a) as being unpatentable over Antos et al. (as applied to claim 1, above) in view of US Patent 6,053,013 (Oh et al.). The Examiner cited Oh et al. as teaching the collapse of the preform tube (the final formation step) in the presence of $Cl_2$ and He. However, the combination of Antos et al. and Oh et al. still lacks any teaching related to using an "oxygen-free ambient" in the formation of an optical fiber preform.

In light of this missing aspect of independent claim 1, appellant believes that dependent claim 17 is allowable in its dependent form and respectfully requests the Board of Appeals to reconsider and reverse the Examiner's final rejection of claim 17.

***F. 35 USC § 103(a) Rejection – Claim 18***

Claim 18 was rejected by the Examiner under 35 USC 103(a) as being unpatentable over Antos et al. (as applied to claim 1, above), when considered with US Patent 4,310,340 (Sakar). The Sakar reference was cited by the Examiner as teaching a preferred temperature for performing the preform tube collapse. However, the combination of Antos et al. and Sakar still lacks any teaching related to using an "oxygen-free ambient" in the formation of an optical fiber preform.

In light of this missing aspect of independent claim 1, appellant believes that dependent claim 18 is allowable in its dependent form and respectfully requests the Board of Appeals to reconsider and reverse the Examiner's final rejection of claim 18.

***G. 35 USC § 103(a) Rejection – Claims 19 and 20***

Lastly, the Examiner rejected independent claim 19 and its associated dependent claim 20 under 35 USC 103(a) as being unpatentable in view of Antos et al., in view of Ishikawa et al., Araujo et al. and Herron et al. However, none of these references disclose or suggest the step of "sintering the soot layer in an oxygen-free environment of $SiCl_4$, He and $H_2$ to form an amorphous glass layer" (claim 19, emphasis added), as defined in independent claim 19. Inasmuch as oxygen is present in the standard environment in which such processes are performed in the art, without an overt, affirmative step to perform the operation in an "oxygen-free environment", appellant asserts that oxygen will indeed be present and result in the generation of defects.

Appellant thus requests the Board of Appeals to reconsider the Examiner's findings on this point, reverse the rejection and allow claims 19 and 20 to pass to issue.

## IX. CONCLUSION

For the reasons expressed above, the Examiner's rejections of claims 1-20 under 35 USC §§ 102(e) and 103(a) are considered to lack merit and thus mandate reversal. Appellant solicits such action from the Board of Appeals at this time.

Respectfully submitted,

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## A. CLAIMS APPENDIX

**1.** (*previously presented*) A method of making an optical preform, the method comprising the steps of:

a) providing an optical preform tube;

b) depositing a porous, unsintered soot layer within the inner surface of said tube;

c) exposing the porous, unsintered soot layer to a flow of a metal halide in an oxygen-free ambient for a period of time sufficient to eliminate the presence of excess oxygen defects in said soot layer;

d) sintering the metal halide-treated soot layer in an oxygen-free ambient to form an amorphous glass layer; and

e) collapsing said sintered preform tub of step d) to form a solid core optical fiber preform.

**2.** *(original)* The method as defined in claim 1 wherein prior to performing step b), one or more cladding layers are deposited on the inner surface of the preform tube provided in step a).

**3.** *(original)* The method as defined in claim 2, wherein the one or more cladding layers comprise a depressed-index cladding.

**4.** *(previously presented)* The method as defined in claim 3, wherein one or more fluorine-doped cladding layers are deposited.

**5.** *(original)* The method as defined in claim 1 wherein in performing step b), the soot is deposited using a low temperature process.

**6.** *(original)* The method as defined in claim 1 wherein in performing step b), the deposit soot comprises $SiO_2$.

**7.** *(previously presented)* The method as defined in claim 6 wherein in performing step b), the deposited $SiO_2$ soot is doped with a material chosen from the group consisting of Al, Si, P, Cl, Ge, Ga, Ta, Pb, and Li.

**8.** *(original)* The method as defined in claim 5 wherein the soot deposition temperature is in the range of approximately 1400 - 1900 °C.

**9.** *(original)* The method as defined in claim 8 wherein the soot deposition temperature is maintained at a value of approximately 1650°C.

**10.** *(original)* The method as defined in claim 1 wherein in performing step c), the metal halide used is $SiCl_4$.

**11.** *(original)* The method as defined in claim 1 wherein in performing step c), the metal halide used is $GeCl_4$.

**12.** *(original)* The method as defined in claim 1 wherein in performing step c), the flow is maintained for a time period of at least ten minutes to at most ten hours.

**13.** *(original)* The method as defined in claim 1 wherein in performing step c), the metal halide treatment is performed in an ambient of He and $N_2$.

**14.** *(original)* The method as defined in claim 1 wherein in performing step c), the metal halide treatment is performed in a temperature range of 800 - 1500 °C.

**15.** *(original)* The method as defined in claim 1 wherein in performing step d), the sintering is performed in an ambient of He and/or $N_2$.

**16.** *(original)* The method as defined in claim 1 wherein in performing step d), the sintering is performed at a temperature of approximately 2200°C.

**17.** *(original)* The method as defined in claim 1 wherein in performing step e), the collapsing occurs in an ambient of $Cl_2$ and/or He.

**18.** *(original)* The method as defined in claim 1 wherein in performing step e), the collapsing occurs at a temperature of approximately 2200°C.

**19.** *(previously presented)* A method of making an optical preform, the method comprising the steps of:

a) providing an optical preform tube;

b) depositing a porous, unsintered soot layer within the inner surface of said preform tube;

c) sintering the soot layer in an oxygen-free environment of $SiCl_4$, He and $H_2$ to form an amorphous glass layer; and

d) collapsing said sintered, metal halide-treated preform tube of step c) to form a solid core optical fiber preform.

**20.** *(original)* The method as defined in claim 19 wherein prior to performing step b), one or more cladding layers are deposited on the inner surface of the preform tube provided in step a).

## B. EVIDENCE APPENDIX

None

## C. RELATED PROCEEDINGS APPENDIX

None